

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1-35. (Canceled)

36. (Previously presented) A tool for determining the amount of a carbon isotope in a fluid, comprising:

- a laser source emitting at least one laser beam;

- a first volume of the fluid positioned so that at least a first portion of a laser beam passes through the fluid;

- a first downstream optical detector positioned to detect said first beam portion after said first beam portion passes through said first volume, said first optical detector emitting a first downstream signal corresponding to the strength of said first beam portion after passing through the first volume;

- a reference cell containing a concentration of the isotope and positioned so that at least a second portion of a laser beam passes through said concentration;

- a second downstream optical detector positioned to detect said second beam portion after said second beam portion passes through said reference cell, said second optical detector emitting a second downstream signal corresponding to the strength of said second beam portion after passing through said reference cell;

a pre-dilution cell containing a portion of the fluid positioned so that at least a third portion of a laser beam passes through the portion of the fluid;

a third downstream optical detector positioned to detect said third beam portion after said third beam portion passes through said pre-dilution cell, said third downstream optical detector emitting a third downstream signal corresponding to the strength of said third beam portion after passing through the pre-dilution cell; and

a microprocessor receiving said first, second, and third downstream signals and calculating from the first and second downstream signals a parameter indicative of the presence of the isotope in the fluid, and wherein the microprocessor determines from the third downstream signal whether and to what degree to dilute the fluid with a diluent.

37. (Previously presented) The tool according to claim 36 wherein said first and second beam portions comprise a single beam.

38. (Previously presented) The tool according to claim 36 wherein said first and second beam portions comprise separate beams.

39. (Previously presented) The tool according to claim 36 wherein said first fluid volume is contained in a cell.

40. (Previously presented) The tool according to claim 36 wherein said first fluid volume is contained in a conduit.

41. (Previously presented) The tool according to claim 36 wherein said microprocessor calculates a concentration of the isotope in the fluid relative to the concentration of the isotope in the reference cell.

42. (Previously presented) The tool according to claim 36 wherein said microprocessor calculates a quantitative concentration of the isotope in the fluid.

43. (Previously presented) The tool according to claim 36 wherein the reference cell contains an unknown concentration of the isotope.

44. (Previously presented) The tool according to claim 36, wherein the reference cell contains a known concentration of the isotope.

45. (Previously presented) The tool according to claim 36, further including a first upstream detector detecting said first beam portion before said first beam portion passes through said first volume and emitting a corresponding first upstream signal; a second upstream optical detector detecting said second beam portion before said second beam portion passes through said reference cell and emitting a corresponding second upstream signal; and a third upstream optical detector

detecting said third beam portion before said third beam portion passes through the pre-dilution cell and emitting a corresponding third upstream signal.

46. (Previously presented) The tool according to claim 45 wherein said microprocessor receives said first, second, and third upstream signals and uses said first and second upstream signals in calculating said parameter indicative of the presence of the isotope in the fluid, and wherein said microprocessor uses said third upstream signal in determining whether and to what degree to dilute the fluid with the diluent.

47. (Previously presented) The tool according to claim 36 wherein the diluent comprises nitrogen.

48. (Previously presented) The tool according to claim 36, wherein the diluent comprises at least one of nitrogen and at least one noble gas.

49. (Previously presented) A tool for determining the amount of a carbon isotope in a fluid, comprising:

a laser source emitting at least one laser beam;

a first volume of the fluid positioned so that at least a first portion of a laser beam passes through the fluid;

a first upstream optical detector positioned to detect said first beam portion before said first beam portion passes through said first volume, said first optical detector emitting a first upstream signal corresponding to the strength of said first beam portion before passing through the first volume;

a first downstream optical detector positioned to detect said first beam portion after said first beam portion passes through said first volume, said first optical detector emitting a first downstream signal corresponding to the strength of said first beam portion after passing through the first volume;

a reference cell containing a concentration of the isotope and positioned so that at least a second portion of a laser beam passes through said concentration;

a second upstream optical detector positioned to detect said second beam portion before said second beam portion passes through said reference cell, said second optical detector emitting a second upstream signal corresponding to the strength of said second beam portion before passing through the reference cell;

a second downstream optical detector positioned to detect said second beam portion after said second beam portion passes through said reference cell, said second optical detector emitting a second downstream signal corresponding to the strength of said second beam portion after passing through said reference cell; and

a microprocessor receiving said first and second upstream and downstream signals and calculating therefrom a parameter indicative of the presence of the isotope in the fluid.

50. (Previously presented) The tool according to claim 49 wherein said first and second beam portions comprise a single beam.

51. (Previously presented) The tool according to claim 49 wherein said first and second beam portions comprise separate beams.

52. (Previously presented) The tool according to claim 49 wherein said first fluid volume is contained in a cell.

53. (Previously presented) The tool according to claim 49 wherein said first fluid volume is contained in a conduit.

54. (Previously presented) The tool according to claim 49 wherein said microprocessor calculates a concentration of the isotope in the fluid relative to the concentration of the isotope in the reference cell.

55. (Previously presented) The tool according to claim 49 wherein said microprocessor calculates a quantitative concentration of the isotope in the fluid.

56. (Previously presented) The tool according to claim 49 wherein the reference cell contains an unknown concentration of the isotope.

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57. (Previously presented) The tool according to claim 49, wherein the reference cell contains a known concentration of the isotope.